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IS 4804-2 (1968): Resistance Welding Equipment, Part II:
Single-Phase Rocker-arm Spot Welding Machines [ETD 21:
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IS : 4804 (Part II) - 1968

Indian Standard (Reaffirmed 2005)

**SPECIFICATION FOR
RESISTANCE WELDING EQUIPMENT**

**PART II SINGLE-PHASE ROCKER-ARM SPOT
WELDING MACHINES**

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BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG

NEW DELHI 110002

Indian Standard

SPECIFICATION FOR RESISTANCE WELDING EQUIPMENT

PART II SINGLE-PHASE ROCKER-ARM SPOT WELDING MACHINES

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Indian Standard
**SPECIFICATION FOR
RESISTANCE WELDING EQUIPMENT
PART II SINGLE-PHASE ROCKER-ARM SPOT
WELDING MACHINES**

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 4 November 1968, after the draft finalized by the Electric Welding Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This part covers single-phase rocker-arm type spot welding machines and designates the electrical ratings together with the mechanical requirements, such as nominal electrode forces, throat depths and clearance, dimensions of arms, etc. Requirements for methods of actuation, operating speeds, cooling and mechanical and electrical features are also specified.

0.3 This standard is not complete by itself and shall be read in conjunction with IS : 4804 (Part I)-1968*.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) covers the essential electrical and mechanical features pertaining to standard sizes of stationary single-phase ac transformer type rocker-arm spot welding machines. It does not include electrical, electronic control equipment.

1.2 This standard does not cover portable, fixture type or gun type rocker-arm resistance welding machines.

*Resistance welding equipment: Part I Single-phase transformers.

†Rules for rounding off numerical values (revised).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Spot Welding — Resistance welding in which the welding current is passed through the components of the workpiece in an area confined by electrodes contacting and applying pressure to produce a weld.

2.2 Rocker-Arm Spot Welding Machine — A spot welding machine fitted with one or both arms pivoted to the frame, carrying an electrode holder and electrode and caused to rock about the pivot(s) by means of manual, air or motor operation.

2.3 Throat Depth — The unobstructed work clearance in a welding machine from the centre line of the electrodes to the nearest point of obstruction of flat work or sheets.

2.4 Throat Clearance — The unobstructed work clearance in a spot welding machine between arms throughout the throat depth.

2.5 Arm — A projecting beam of a resistance welding machine which transmits the electrode force and may conduct the welding current.

2.6 Electrode — A replaceable portion of a resistance welding machine which transmits current, and usually applies pressure directly on to the workpiece.

2.7 Nominal Electrode Force — The theoretical force transmitted by the electrodes to the components of the workpiece.

2.8 Electrode Holder — A device used for mechanically holding the electrode and conducting current to it.

2.9 Welding Current — The current passing through the parts to be welded at the fused area.

2.10 Platen — In a resistance welding machine a member with a substantially flat surface to which dies, fixtures, backups or electrode holders are attached and which transmits the electrode force or up-setting force.

3. DESIGN AND PERFORMANCE

3.1 Methods of Actuation — For all machine sizes the methods of actuation shall be manual, pneumatic or motor operated (*see Table 1*), as follows:

- a) *Manual Actuation* — Manual actuation shall be by means of a foot-operated pedal acting through a connecting rod and adjustable spring.

- b) *Pneumatic Actuation* — Pneumatic actuation shall be by means of an air cylinder.
- c) *Motor Actuation* — Motor actuation shall be by means of a motor operating through a variable speed device, and/or gear box, cam and adjustable spring. The arrangement of the means of actuation shall be such as to provide a variable speed ratio of approximately 3 to 1 and permit control by a foot-operated clutch.

3.2 Maximum Operating Speeds — Pneumatic and motor operated welding machines, when working with a 13 mm electrode stroke, shall be capable of operation at:

- a) 100 strokes per minute for throat depths of 450 mm and less, and
- b) 80 strokes per minute for throat depths of over 450 mm.

3.3 Electrical Ratings - The preferred ratings in kVA at 50 percent duty cycle shall be 5, 7.5, 10, 15, 30 and 50.

3.4 Nominal Electrode Force — The nominal electrode force when measured at a 300 mm throat depth shall be in accordance with the relevant value given in Table 1. Values of electrode forces at other throat depths shall vary inversely as the throat depth.

3.5 Mechanical Features

3.5.1 Nominal Throat Depth and Clearance — Nominal throat depths and clearances shall be as given in Table 1.

NOTE — Although a range of dimensions is shown in Table 1, this does not necessarily mean that the throat depths and clearances are infinitely variable within that range.

3.5.2 Arms, Electrode Holders and Electrodes — The diameters of rocker-arms and electrode holders shall be as given in Table 1.

The size and taper of electrodes shall be as given in Table 1.

3.5.3 Lower Arm Horizontal Adjustment — The minimum horizontal adjustment of the lower arm for all machine sizes shall be 12.5 mm on either side of the centre-line of the platen.

3.5.4 Electrode Opening — The minimum electrode opening for all machine sizes shall be:

- a) 38 mm for manually actuated machines, and
- b) 32 mm for pneumatic or motor actuated machines.

The openings are based on a 300 mm throat depth, with other electrode openings being directly proportional to the change in throat depth from 300 mm.

TABLE 1 MECHANICAL STANDARDS FOR ROCKER-ARM TYPE SPOT WELDING MACHINES

(Clauses 3.1, 3.4, 3.5.1 and 3.5.2)

| RATING kVA AT 50 PER- CENT DUTY CYCLE | ROCKER- ARM Dia mm | NOMINAL THROAT CLEAR- ANCE | | ELECTRODE HOLDER FOR MORSE TAPER | | | | ELECTRODE HOLDER FOR ISO TAPER | | | | NOMINAL ELECT- RODE FORCE AT 30 cm THROAT DEPTH* | | NOMI- NAL THROAT DEPTH |
|--|-----------------------------|-------------------------------------|-----------|-------------------------------------|-----------|-----------|--------------|-----------------------------------|------------|--------------------------|--|---|-------------|---------------------------------|
| | | Min | Max | Morse Taper No. | Length | | ISO Taper | Length | | Manual opera- tion | Pneuma- tic/ Motor opera- tion | | | |
| | | | | | Upper | Lower | | Dia | Upper | | | Lower | Dia | |
| | | | | | | | | | | | | | | |
| (1) kVA | (2) mm | (3) mm | (4) mm | (5) | (6) mm | (7) mm | (8) mm | (9) | (10) mm | (11) mm | (12) mm | (13) kgf | (14) kgf | (15) cm |
| — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 5 | 32 | 100 | 200 | 1 | 150 | 200 | 19 | 13 | 150 | 200 | 19 | 50 | 55 | 20, 30, 40 |
| 7.5 | 38 | 100 | 200 | 1 | 150 | 200 | 19 | 13 | 150 | 200 | 19 | 65 | 85 | 20, 30, 40 |
| 10 | 38 | 100 | 200 | 1 | 150 | 200 | 25 | 13 | 150 | 200 | 25 | 100 | 110 | 20, 30, 40 |
| 15 | 51 | 125 | 350 | 2 | 200 | 300 | 25 | 16 | 200 | 300 | 25 | 135 | 250 | 30, 46, 60 |
| 30 | 64 | 150 | 380 | 2 | 200 | 300 | 25 | 16 | 200 | 300 | 25 | 200 | 400 | 30, 46, 60, 76, 91 |
| 50 | 64 | 150 | 380 | 2 | 200 | 300 | 31,5 | 16 | 200 | 300 | 31,5 | 250 | 500 | 30, 46, 60, 76, 91 |

NOTE — Ratings below 5 kVA have not been included since short-circuit current data is not available. There is also no data on force, tapers, etc.

*Nominal electrode force values are based on air line supply pressure of 5.6 kg/cm² for pneumatically operated machines, and operator's force on the foot pedal of 30 kgf in the case of manually operated machines.

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The machine shall be so adjusted that at the end of the stroke the electrodes are together and the arms are horizontal and parallel.

3.6 Accessories for Pneumatic Actuation—Air-line accessories shall include the following:

- a) Simple air strainer,
- b) Air line lubricator,
- c) Air pressure regulating valve,
- d) Air (welding) pressure gauge, and
- e) Air speed control valves or air cylinder cushions (optional).

3.7 Water Cooling — When machines are provided with water cooling, they shall be in accordance with the following requirements:

- a) A minimum of one circuit shall be provided for machines having a rating up to and including 30 kVA;
- b) A minimum of two circuits shall be provided for machines having a rating of 50 kVA, if the transformer is of the water cooled type;
- c) A suitable visual drain manifold shall be provided with all machines;
- d) A suitable inlet shall be provided; and
- e) Where a machine has more than one cooling circuit it shall have flow adjusting valves for each cooling circuit.

3.8 Electrical Features

3.8.1 Voltage adjustment shall be obtained through a plug or link arrangement or tap change switch of not less than 6 steps, providing a minimum open circuit secondary voltage which shall be 55 to 65 percent of the maximum open circuit voltage.

3.8.2 Initiating Control—The nominal voltage on any initiating switch shall not exceed 110 volts.

NOTE — This stipulation is not applicable to small machines below 30 kVA rated capacity.

3.8.3 Test for Rating (Maximum Conventional Power at 50 Percent Duty Cycle) — The secondary circuit of the transformer shall be short circuited in the manner described in 3.8.4. The temperature-rise test shall then be carried out in accordance with the method described in clause 7.6 of IS: 4804 (Part I)-1968*.

*Specification for resistance welding equipment: Part I Single-phase transformers.

3.8.4 Short-Circuit Conditions — A copper rod shall be substituted for the two electrode holders and this shall be clamped securely in the top and bottom arms to produce the required short-circuit. The arms of the machine shall be adjusted to produce the throat clearance and throat depth as specified in the name plate.

3.8.5 Short-Circuit Secondary Current

3.8.5.1 The short-circuit secondary current when determined in the relevant manner described in IS:4804 (Part I)-1968* with the throat clearance and the throat depth as specified in Table 2, shall comply with the minimum values given therein.

TABLE 2 THROAT DEPTH, CLEARANCE AND MINIMUM SHORT-CIRCUIT CURRENT

| TRANSFORMER RATING AT 50 PERCENT DUTY CYCLE | THROAT DEPTH | THROAT CLEARANCE | MINIMUM SHORT- CIRCUIT CURRENT |
|---|--------------|---------------------|-----------------------------------|
| (1) kVA | (2) cm | (3) mm | (4) kA |
| 5 | 20 | 150 | 6.3 |
| | 30 | | 5.4 |
| | 40 | | 4.5 |
| 7.5 | 20 | 150 | 7.7 |
| | 30 | | 6.8 |
| | 40 | | 5.4 |
| 10 | 20 | 150 | 9.0 |
| | 30 | | 7.7 |
| | 40 | | 6.3 |
| 15 | 30 | 200 | 9.0 |
| | 46 | | 8.1 |
| | 60 | | 7.2 |
| 30 | 30 | 200 | 17.1 |
| | 46 | | 14.0 |
| | 60 | | 12.2 |
| | 76 | | 10.8 |
| | 91 | | 9.5 |
| 50 | 30 | 200 | 22.5 |
| | 46 | | 18.9 |
| | 60 | | 16.2 |
| | 76 | | 14.4 |
| | 91 | | 13.1 |

*Specification for resistance welding equipment: Part I Single-phase transformers.

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3.8.5.2 The transformer shall be capable of operating at no less than 4 percent duty cycle at the indicated short-circuit current without exceeding the temperature rise specified in IS : 4804 (Part I)-1968*.

NOTE — For the purpose of compliance with this clause, it shall suffice to compute the duty cycle in accordance with the formula given in clause 4.3.1 in IS : 4804 (Part I)-1968*, P_s being taken as the product of the minimum, short-circuit current in kA and the maximum open-circuit secondary voltage.

4. MARKING

4.1 Name Plate — The following information shall be legibly and indelibly marked on the name plate:

- a) The name of the manufacturer and/or trade-mark;
- b) Manufacturer's type and serial number;
- c) The number of this Indian Standard [Ref IS : 4804 (Part II)];
- d) Maximum conventional power in kilo volt amperes at 50 per cent duty cycle;
- e) Maximum short-circuit power, P_m in kVA;
- f) Maximum short-circuit secondary current in amperes;
- g) Supply voltage and frequency;
- h) Maximum and minimum open circuit secondary volts;
- j) Class of insulation;
- k) Litres per minute, cooling water (where applicable);
- m) Maximum electrode force, in kgf (where applicable);
- n) Maximum throat depth;
- p) Maximum throat clearance;
- q) Air pressure, in kgf/cm² range (where applicable);
- i) Water pressure, in kgf/cm² range (where applicable);
- s) Maximum temperature of input cooling water;
- t) Country of manufacture; and
- u) Weight of the equipment.

4.1.1 The welding machine may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*Specification for resistance welding equipment: Part I Single-phase transformers.

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